

Outcome of Differentiated Thyroid Carcinoma Patients After 5 Years of Radioiodine Ablation at INMAS, Rajshahi

¹Shibli Nishad Alam, ²Mostofa Shamim Ahsan, ³Nasrin Begum, ⁴Tasnim Ahmed, ⁴Tanvir Ahmed, ⁵Md. Shariful Islam Chowdhury.

¹Medical Officer, ²Director & Chief Medical Officer, ³Principal Medical Officer, ⁴Senior Medical Officer, ⁵Principal Scientific Officer, Institute of Nuclear Medicine & Allied Sciences (INMAS), Rajshahi Medical College Campus, Rajshahi.

Correspondence Address: Dr. Shibli Nishad Alam, Medical Officer, INMAS, Rajshahi
Email: shiblinishad@gmail.com Contact No.: +8801712617000

ABSTRACT

Introduction: Radioactive iodine (RAI) ablation is a well-established treatment modality for differentiated thyroid carcinoma (DTC). The Institute of Nuclear Medicine and Allied Sciences (INMAS), Rajshahi, has been providing RAI therapy for several years, and its management protocol was upgraded in 2015 by the Society of Nuclear Medicine Bangladesh. The objectives of this study were to assess the long-term outcome of RAI ablation in patients with DTC, evaluate therapeutic response in iodine-avid metastases, and determine the disease-free status of patients after treatment.

Materials and Methods: This retrospective study included 257 patients diagnosed with DTC who received RAI ablation between January 2015 and December 2017 at INMAS, Rajshahi. All patients had previous surgical treatment. Based on risk stratification, low-risk patients received 30–100 mCi of iodine-131, while intermediate and high-risk patients received doses greater than 100–200 mCi. Follow-up assessment included diagnostic whole-body scintigraphy, serum thyroglobulin (Tg), anti-thyroglobulin antibody (anti-Tg Ab), and high-resolution ultrasound (HRUS) of the neck. Treatment response was categorized as complete response (CR) or persistent disease (PD).

Results: Among the 257 patients, 89 (34.63%) were male and 168 (65.37%) were female. Five patients were lost to follow-up. Papillary carcinoma accounted for 235 cases (93.25%) while follicular carcinoma accounted for 17 cases (6.74%). After one year, 231 patients (89.68%) were disease-free based on negative imaging and biochemical markers. Twenty-one patients required additional evaluation or therapy due to residual tissue or metastases. After an average follow-up of five years, complete response was observed in 239 patients (94.84%) while persistent disease or recurrence occurred in 13 patients (5.16%).

Conclusion: RAI ablation is highly effective for achieving disease control in patients with DTC, particularly in iodine-avid locoregional disease. However, patients with iodine non-avid metastases show limited response and require alternative therapeutic strategies.

Keywords: Differentiated thyroid carcinoma, Radioactive iodine, Papillary thyroid carcinoma, Follicular thyroid carcinoma, whole-body scan, Serum thyroglobulin, Anti-thyroglobulin antibody.

Bangladesh J. Nucl. Med. Vol. 28 No. 2 July 2025

DOI: <https://doi.org/10.3329/bjnm.v28i2.89137>

INTRODUCTION

Differentiated thyroid carcinoma (DTC) is the most common endocrine malignancy worldwide, accounting for more than 90% of thyroid cancers (1). The two principal histological subtypes are papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC). Although DTC generally has a favorable prognosis, recurrence and metastasis remain significant clinical concerns (2).

Management of DTC typically involves a combination of total or near-total thyroidectomy followed by radioactive iodine (RAI) ablation and long-term thyroid hormone suppression therapy. RAI ablation using iodine-131 plays a crucial role in eliminating residual thyroid tissue, treating microscopic disease and improving the sensitivity of follow-up investigations (3).

The therapeutic mechanism of iodine-131 is based on the ability of thyroid follicular cells to concentrate iodine through the sodium-iodide symporter. This property allows selective targeting of residual thyroid tissue and metastatic lesions that retain iodine avidity. RAI ablation has therefore become a cornerstone in the management of patients with intermediate and high-risk differentiated thyroid carcinoma (4).

However, not all patients respond equally to RAI therapy. Some metastatic lesions may become iodine non-avid due to dedifferentiation of tumor cells, resulting in resistance to RAI treatment and poorer outcomes (5). Identifying such cases early is important in guiding alternative therapeutic approaches, including targeted therapy, external beam radiotherapy, or surgery.

Thyroid cancer, particularly DTC, is becoming more

common both globally and in Bangladesh (6). Nuclear medicine facilities have gradually expanded in recent years in this country. The Bangladesh Atomic Energy Commission established multiple institutes under the Institute of Nuclear Medicine and Allied Sciences (INMAS) network to provide diagnostic and therapeutic nuclear medicine services. Among them, the Institute of Nuclear Medicine and Allied Sciences at the Rajshahi Medical College campus has been providing RAI therapy for thyroid cancer patients for many years.

In 2015, treatment protocols at INMAS Rajshahi were updated following national recommendations from the Society of Nuclear Medicine Bangladesh (7). Evaluating the long-term outcome of patients treated under these protocols is important for assessing the effectiveness of current clinical practices. (8)

This study evaluated the five-year outcomes of patients with differentiated thyroid carcinoma who underwent radioactive iodine ablation at INMAS Rajshahi, focusing on treatment response in iodine-avid metastases and the disease-free status during follow-up.

PATIENTS AND METHODS

Study Design

This Retrospective observational study was conducted at INMAS, Rajshahi, Rajshahi Medical College campus, Bangladesh. Data from the registered DTC patients of thyroid division of INMAS, Rajshahi were collected from institutional records.

Study Population

A total of 257 patients diagnosed with differentiated thyroid carcinoma who underwent radioactive iodine ablation between January 2015 and December 2017 were included. All patients had previously undergone surgical treatment, mostly total or near-total thyroidectomy.

Inclusion Criteria

- Histologically confirmed differentiated thyroid carcinoma
- Patients who underwent surgical treatment followed by RAI ablation
- Patients treated between January 2015 and December 2017

- Availability of follow-up data

Exclusion Criteria

- Patients with incomplete records
- Patients who did not receive RAI therapy
- Patients lost to follow-up before initial evaluation

Five patients were lost during follow-up and therefore excluded from final outcome analysis.

Risk Stratification

Patients were categorized into risk groups according to clinicopathological characteristics such as tumor size, lymph node involvement, extrathyroidal extension, and distant metastasis, in accordance with established thyroid cancer management guidelines.

Radioactive Iodine Therapy Protocol

All patients received oral iodine-131 therapy after appropriate preparation including thyroid hormone withdrawal.

Dose selection was based on risk stratification:

- Low-risk patients: 30–100 mCi
- Intermediate- and high-risk patients: >100–200 mCi

Patients were admitted to isolation wards as required for radiation safety until the exposure level reached acceptable limits.

Follow-up Protocol

After RAI ablation, patients were followed up periodically with clinical evaluation and laboratory investigations. Follow-up assessment of the patient included diagnostic whole-body scan (WBS), serum thyroglobulin (Tg) measurement, anti-thyroglobulin antibody (Anti-Tg Ab) level and high-resolution ultrasound (HRUS) of the neck. Additional imaging modalities were utilized where clinically indicated.

Outcome Measures

Treatment response was categorized into two groups:

Complete Response (CR): CR was considered if the patient showed no abnormal uptake on diagnostic

whole-body scan, HRUS of neck was unremarkable and Tg and anti-Tg were undetectable or very low Tg levels.

Persistent Disease (PD): PD was considered if there was evidence of structural disease in whole body scan or persistently elevated Tg levels or evidence of metastasis in HRUS of neck.

RESULTS

A total of 257 patients were initially enrolled in the study. Patient demographics are shown in Table-1. The male-to-female ratio was 1:1.9, indicating a higher prevalence among females. The median age of the patients was 43 years, with a standard deviation (SD) of approximately 11.5 years, indicating a moderate spread of age distribution around the mean. Five patients were lost to follow-up, leaving 252 patients for final analysis.

Table-1: Demographic characteristics of the differentiated thyroid carcinoma patients attending INMAS, Rajshahi

Gender	Frequency (%)
Male	89 (34.63%)
Female	168 (65.37%)
n = 257	

Age distribution of patients	
15-20 yrs	5 (1.9%)
21-30 yrs	29 (11.3%)
31-40 yrs	72 (28.0%)
41-50 yrs	85 (33.1%)
51-60 yrs	46 (17.9%)
61-70 yrs	20 (7.8%)

Histopathological Distribution

Among the analyzed patients:

- **Papillary carcinoma:** 235 patients (93.25%)
- **Follicular carcinoma:** 17 patients (6.74%)

Papillary carcinoma was therefore the predominant histological subtype.

One-Year Treatment Outcome

After one year of follow-up, **231 patients (89.68%)** were considered disease-free. These patients had negative diagnostic whole-body scan findings. Serum Tg and Anti-Tg antibody levels were within acceptable limits

and HRUS of the neck showed no evidence of residual disease

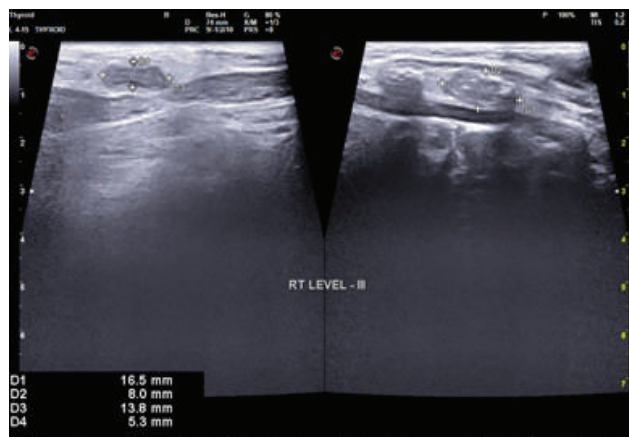


Figure 1: High resolution ultrasound (HRUS) image showing cervical lymphadenopathy with microcalcifications (suspicious for metastasis).

Additional Interventions

Among the remaining 21 patients (10.31%), 4 required a second RAI ablation due to residual thyroid tissue, while 2 patients demonstrated iodine-avid cervical lymph node metastasis. A larger group of 10 patients exhibited iodine non-avid lymph node metastasis. Additionally, 1 patient presented with diffuse iodine-avid pulmonary metastasis and required three ablation sessions. Iodine non-avid distant metastases were also observed, including lung metastasis in 2 patients and bone metastasis in another 2 patients.

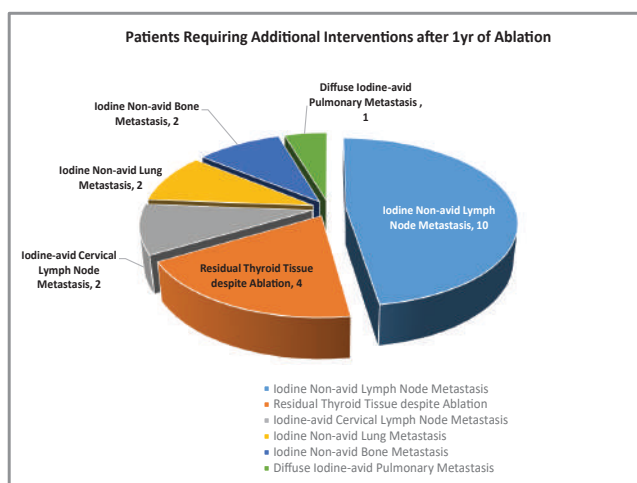


Figure 2: Patients requiring additional interventions after one year of RAI ablation are shown with the type of metastases

Repeated ablation in iodine non-avid metastasis showed disappearance of metastatic lymph nodes in only one patient.

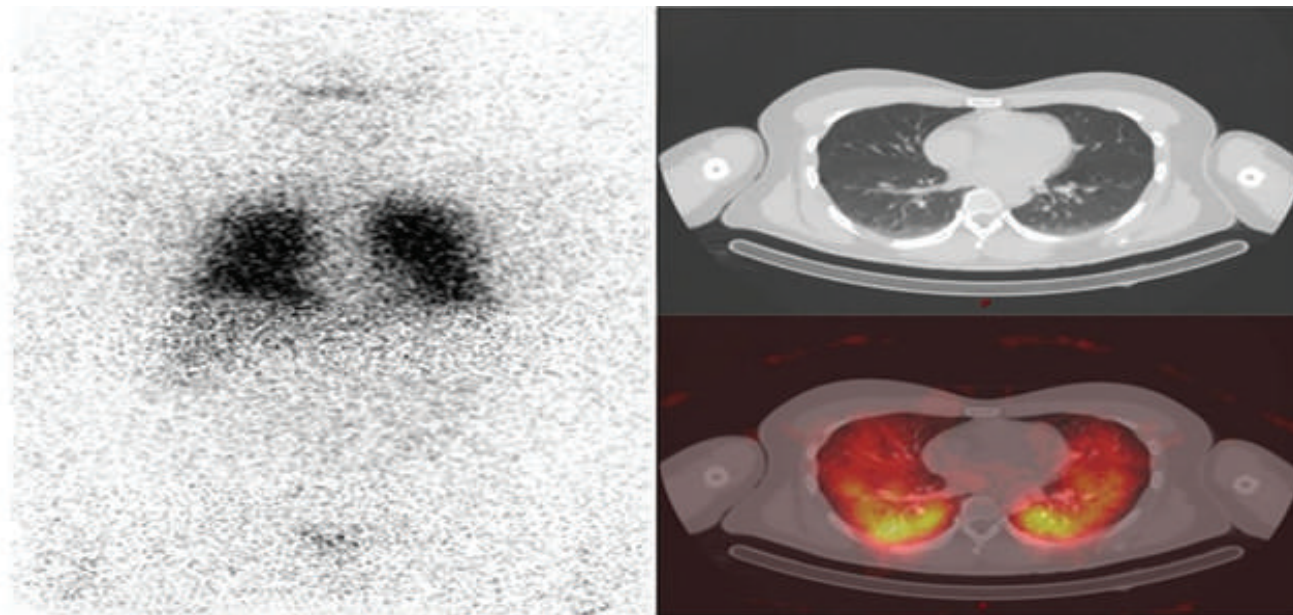


Figure 3: (A) Whole body scan after 1 year of RAI ablation shows empty thyroid bed but patchy uptake in both lung fields, suggesting iodine-avid bilateral diffuse pulmonary metastasis. (B) Chest CT image showing micrometastasis in both lungs. (C) SPECT-CT fusion image showing bilateral lung metastasis.

Five-Year Outcome

The average follow-up duration was five years and the final outcomes are shown in table-02:

Outcome	Frequency (%)
Complete response (CR)	239 patients (94.84%)
Persistent Disease (PD) or Recurrence	13 patients (5.16%)

Radioiodine Dose and Biochemical Markers

In patients with complete response mean administered RAI dose was 86.4 ± 28.3 mCi. Subsequent follow-up revealed their initial average Tg level was 32.5 ng/ml and average follow-up Tg level: 1.3 ng/ml.

For patients with persistent disease, the mean administered RAI dose was 338 ± 17.5 mCi, average initial Tg level was 163.2 ng/ml and average follow-up Tg level was 182.0 ng/ml with rising trend.

DISCUSSION

Differentiated thyroid carcinoma generally has an excellent prognosis, especially when treated with surgery followed by radioactive iodine ablation (9). The present study demonstrated a high rate of complete response among patients treated at INMAS Rajshahi.

The predominance of female patients observed in this study is consistent with global epidemiological patterns of thyroid cancer (10). Previous studies have reported that thyroid carcinoma occurs two to three times more frequently in females than males (11).

Papillary carcinoma constituted more than 90% of cases in this cohort. This finding aligns with international data showing papillary carcinoma as the most common subtype of differentiated thyroid cancer (12).

The one-year disease-free rate of nearly 90% observed in this study reflects the effectiveness of combined surgical and RAI therapy. Similar results have been reported in several international studies where RAI ablation significantly reduced recurrence rates and improved disease-free survival (4).

Another important finding was the difference in treatment response between iodine-avid and iodine non-avid metastases. Patients with iodine-avid metastases responded well to repeated RAI therapy, while those with non-avid metastases showed poor response. This observation has been widely reported in previous literature (5).

The five-year complete response rate of 94.84% in the present study indicates favorable long-term outcomes. Comparable survival and disease-free rates have been reported in other studies evaluating the effectiveness of RAI therapy in differentiated thyroid carcinoma (13).

Serum thyroglobulin proved to be an important biomarker in monitoring treatment response. Patients who achieved complete response demonstrated a marked decline in Tg levels during follow-up, whereas patients with persistent disease showed persistently elevated or rising Tg levels.

Despite the overall favorable outcome, a small proportion of patients developed persistent disease or recurrence. Management of these patients remains challenging, especially when metastases are iodine non-avid. In such cases, alternative treatment modalities including targeted therapies and external beam radiotherapy may be considered (14).

The findings of this study highlight the effectiveness of RAI ablation in the management of differentiated thyroid carcinoma within the Bangladeshi healthcare context. Continued monitoring and further research involving larger patient populations will help refine treatment protocols and improve outcomes.

CONCLUSION

Radioactive iodine ablation is highly effective in achieving treatment goals in patients with differentiated thyroid carcinoma, particularly in cases with iodine-avid residual disease or metastasis. The majority of patients in this study achieved complete response after RAI ablation with favorable long-term outcomes.

However, patients with iodine non-avid metastases showed limited response to repeated RAI therapy. These cases require alternative therapeutic strategies and closer monitoring. Long-term follow-up using imaging and

biochemical markers remains essential for early detection of recurrence and optimal patient management.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest.

REFERENCES

1. Macvanin, M.T., Gluovic, Z.M., Zanic, B.L., Essack, M., Gao, X. and Isenovic, E.R., 2023. New biomarkers: prospect for diagnosis and monitoring of thyroid disease. *Frontiers in Endocrinology*, 14, p.1218320.
2. Haugen, B.R. et al., 2016. Management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer. *Thyroid*, 26(1), pp.1–133.
3. Schlumberger, M. et al., 2014. Strategies of radioiodine ablation in thyroid cancer. *Nature Reviews Endocrinology*, 10(9), pp.525–533.
4. Durante, C. et al., 2018. Long-term outcome of differentiated thyroid cancer. *Journal of Clinical Endocrinology & Metabolism*, 103(10), pp.3706–3715.
5. Lamartina, L., Grani, G. and Schlumberger, M., 2018. Radioiodine-refractory thyroid cancer. *Endocrine-Related Cancer*, 25(7), pp.R385–R400.
6. Matin, M.A., Islam, M.S., Razzak, M.A., Khanam, M., Al Harun, M.A., Kabir, S., Saifuddin, A.K.M. and Sobhan, A.K.M.A., 2021. Incidence of Thyroid Cancer in Thyroid Swelling, Study of 200 Cases. *Bangladesh Journal of Otorhinolaryngology*, 27(1), pp.12-16.
7. Sultana, S., Nahar, N., Begum, F., Alam, F., Hasan, M., Hussain, R., Haque, M., Nasreen, F., Khan, M.H., Nisa, L. and Moslem, F., 2015. Management of patients with differentiated thyroid carcinoma-SNMB guidelines. *Bangladesh Journal of Nuclear Medicine*, 18(1), pp.73-84.
8. Schmidbauer, B., Menhart, K., Hellwig, D. and Grosse, J., 2017. Differentiated thyroid cancer—treatment: state of the art. *International journal of molecular sciences*, 18(6), p.1292.
9. Cabanillas, M.E., McFadden, D.G. and Durante, C., 2016. Thyroid cancer. *The Lancet*, 388(10061), pp.2783–2795.
10. Kitahara, C.M. and Sosa, J.A., 2016. The changing incidence of thyroid cancer. *Nature Reviews Endocrinology*, 12(11), pp.646-653.
11. Siegel, R.L., Miller, K.D. and Jemal, A., 2022. Cancer statistics. *CA: A Cancer Journal for Clinicians*, 72(1), pp.7–33.
12. Haugen, B.R., Sawka, A.M., Alexander, E.K., Bible, K.C., Caturegli, P., Doherty, G.M., Mandel, S.J., Morris, J.C., Nassar, A., Pacini, F. and Schlumberger, M., 2017. American Thyroid Association guidelines on the management of thyroid nodules and differentiated thyroid cancer task force review and recommendation on the proposed renaming of encapsulated

- follicular variant papillary thyroid carcinoma without invasion to noninvasive follicular thyroid neoplasm with papillary-like nuclear features. *Thyroid*, 27(4), pp.481-483.
13. Mazzaferri, E.L. and Kloos, R.T., 2001. Current approaches to primary therapy for papillary and follicular thyroid cancer. *The Journal of Clinical Endocrinology & Metabolism*, 86 (4), pp.1447-1463.
 14. Brose, M.S., Nutting, C.M., Jarzab, B., Elisei, R., Siena, S., Bastholt, L., De La Fouchardiere, C., Pacini, F., Paschke, R., Shong, Y.K. and Sherman, S.I., 2014. Sorafenib in radioactive iodine-refractory, locally advanced or metastatic differentiated thyroid cancer: a randomised, double-blind, phase 3 trial. *The Lancet*, 384(9940), pp.319-328.